

Original paper

A Prospective Study of Neonatal Pneumothorax in Holy Karbala

Firas Shakir Al-Fahham¹, Khalid Khaleel –Araji², Hasan Mohammedridha AL- Qazzaz^{3*}

¹Cardiothoracic unit, Al-Hussein medical city, department of surgery, Karbala University, College of medicine.

²Neonatal care unit, Karbala pediatric hospital, department of pediatrics Karbala University, College of medicine.

³General surgical unit, Al-Hussein medical city, department of surgery, Karbala University, College of medicine.

Abstract

Background: Pneumothorax is the accumulation of air in the space between the parietal and visceral pleura, and is potentially a very serious problem, especially if it occurs in the neonatal population.

Patients and Method: A prospective data of sixty newborn infants with pneumothoraces were observed and treated at the Neonatal Care Units in teaching pediatric hospital and gynecological and obstetric teaching hospital in karbala, Iraq, between January 2012 and January 2014 are included in this descriptive study.

Patients were evaluated for: sex, gestational age, birth weight; method of delivery; time of pneumothorax development; localization of pneumothorax and the presence of concurrent lung pathology.

Diagnosis of pneumothorax done by clinical assessment, and chest X-rays. symptomatic patients were treated with a tube thoracostomy and closed underwater drainage.

Results: Sixty neonates with pneumothoraces were included in this study. Sixty three percent of patients were male. Fifty five percent of patients were preterm babies. Fifty three percent were delivered by caesarean section. Seventy seven percent of pneumothoraces were on the right side. Seventy percent cases of pneumothoraces were presented within the first 48 hours of life. Seventy three percent diagnosed as respiratory distress syndrome which is the most common pathology. Mechanical ventilation was performed in 8 patients, including four of the six fatal cases. Tube thoracostomy and closed underwater drainage were performed in 56 patients (93%), while pneumothorax resolved spontaneously in four cases. Mortality rate was 10%.

Conclusion: pneumothorax may develop during the neonatal period, especially in the presence of risk factors. Treatment is effective, if the disease is recognized and treated as early as possible.

Keywords: pneumothorax, neonate, preterm.

Introduction

Pneumothorax is the accumulation of air in the space between the parietal and visceral pleura and it is more frequent in the neonatal period than at any other time in life. Symptomatic pneumothorax occurs in 0.08% of all live births and 5% to 7% of infants with birth weight below 1500 g

(1,2,3). Pneumothorax in newborns has a significant mortality and morbidity (4).

The risk for pneumothorax is higher in infants with respiratory distress syndrome, meconium aspiration syndrome, and pulmonary hypoplasia, and in infants who need resuscitation at birth (3,4). Pneumothorax and pneumomediastinum should be suspected in any newborn infant

*For Correspondence: E-Mail drhassan1979@gmail.com

who shows signs of respiratory distress, displays restlessness, irritability, or has a sudden change in respiratory condition. The first inspiratory effort in the infant produces transpulmonary pressure higher than 100 cm of water column and opens the lungs that were collapsed intra utero. After the first few breaths, this pressure is normalized and the lungs takeover its function. If this transpulmonary pressure remains elevated for a long time, it leads to alveolar rupture and consecutive pneumothorax. This type of pneumothorax is known as spontaneous (primary, idiopathic) pneumothorax^(3,4,5,6). The risk of developing a secondary pneumothorax is higher in patients with respiratory distress syndrome, meconium aspiration, pulmonary hypoplasia, as well as in reanimated neonates^(6,7).

Diagnosis is based on history, clinical examination, gas analysis and chest radiography. In unclear cases, finding can be supplemented with computerized tomography or ultrasound^(8,9).

Chest radiography shows translumination in the area affected by pneumothorax and collapsed lung. In severe cases of pneumothoraces (tension pneumothorax) specially patients on mechanical ventilation, trachea and mediastinum have moved to contralateral side, intercostal spaces on affected side widened and hemidiaphragm pushed downward^(9,10).

Therapeutic approach should be adapted to each neonate according to clinical condition of patient, chest radiography, and experience of a surgeon. General attitude is that infants with asymptomatic pneumothorax, with no previous lung pathology, treated conservatively with close observation^(9,10). while those patients with symptomatic pneumothoraces, thoracic drainage is recommended: thoracocentesis (in mild form), to evacuate the air from the pleura with a needle, or thoracostomy (in severe cases), to evacuate the air by placing the thoracal drain with under water seal in the pleural space)^(10, 11).

Patients and methods

This is a prospective study of neonates with pneumothorax in karbala city. Data collection, observation and management were done at the neonatal care unit in teaching pediatric hospital and neonatal care unit in gynecological and obstetric teaching hospital in karbala, Iraq, between January 2012 and January 2014.

Patients with pneumothoraces were evaluated for the following: sex, gestational age (term is equal or more than 37 weeks; preterm is less than 37 weeks); method of delivery (vaginal delivery or caesarean section); time of pneumothorax development (less than 48 hours, or more than 48 hours post-delivery); localization of pneumothorax (right hemithorax, left hemithorax or bilateral hemithorax); the presence of one or more concurrent diseases including (respiratory distress syndrome, meconium aspiration, pneumonia), history of mechanical ventilation and history of asphyxiation and cardiopulmonary resuscitation immediately after delivery.

diagnosis of pneumothorax was based on a clinical assessment (history and examination) and chest X-rays which reveled translucency in the area affected by pneumothorax with collapsed lung. asymptomatic pneumothorax, with no previous lung pathology, was kept under close observation without surgical intervention. symptomatic patients were treated with a tube thoracostomy and closed underwater drainage using 8 – 12 F chest tubes through the fifth intercostal space.

Chest radiography was performed after insertion of tube thoracostomy to ensure the correct position of tube and expansion of the lung. drain was clamped for 24 hours after confirmation of full expansion of affected lung , which was proven by serial radiographies. In cases that were mechanically ventilated, chest drains were not removed until extubation. Daily assessments was done for the patients

during their stay in the Neonatal Care Unit. Mortality rate was also evaluated.

Results

In total, sixty neonates with pneumothorax (age range 1–10 days) were included in this study. Thirty eight patients (63.33%) were male.

Thirty three (55%) patients were preterm babies born before the 37th gestational

week, while the remaining 45%, were full term.

Forty six patients (77%) were infants with birth weight less than 2500 grams.

Thirty two neonates (53%) were delivered by caesarean section.

In forty six patients (77%), pneumothorax was on the right side hemithorax. In eight patients (13%), pneumothorax was on the left side, while in the remaining six patients (10%) with pneumothorax were bilateral table 1.

Table 1. side distribution

<i>side</i>	No.	%
right hemithorax	46	77%
left hemithorax	8	13%
bilateral hemithorax	6	10%
total	60	100%

Forty two patients (70%) with pneumothorax were presented within the first 48 hours post-delivery.

The existence of pulmonary pathology was confirmed in all of the neonates, and was

usually associated with hyaline membrane disease in 44 patients (73%), meconium aspiration in 6 patients (10%) and pneumonia in 4 patients (7%), table 2.

Table2. pulmonary pathology distribution

<i>pulmonary pathology</i>	No.	%
hyaline membrane disease	44	73%
Meconium aspiration	6	10%
Transient tycheptic attack	6	10%
pneumonia	4	7%
total	60	100%

Eighteen of the sixty patients had a history of cardiopulmonary resuscitation immediately after delivery. Mechanical ventilation was performed in 8 patients, including four of the six died cases.

While tube thoracostomy and closed underwater drainage were performed in 56 patients (93.33%), pneumothorax resolved spontaneously in four cases.

In thirty six patients (60%), the air leak ceased in the first 12 – 24 h. The drainage period was (3 – 4 days).

six patients died. Four were premature, very low birth weight with hyaline membrane disease and on mechanical ventilation. one with meconium aspiration and one with pneumonia. Mortality rate was 10% and was recorded in the population of patients with low Apgar score, premature patients with pulmonary pathology and those on mechanical ventilation.

Table 3. risk factor for mortality

<i>Risk factor for died patients</i>	No.	%
Premature with hyaline membrane disease on Mechanical ventilation	4	68%
Meconium aspiration	1	16%
pneumonia	1	16%
total	6	100%

Discussion

Neonatal pneumothorax is a life threatening condition that is associated with high morbidity and mortality ⁽¹⁾. Despite the high incidence, only 0.5% of cases of pneumothorax are symptomatic ^(4,12). It is known that pneumothorax occurs more often in males than in females ^(5,12).

This was confirmed in the present study, where 38 (63%) of the patients were boys.

This study present the prematurity as a risk factor as thirty three (55%) of cases were premature. The increased incidence in the group with lower gestational age is caused by immaturity of the lung parenchyma, due to the lack of surfactant and high surface tension, that causes "air capture" with the first breath in these alveoli, which results in their rupture ^(11,12).

Caesarean section is another risk factor for pneumothorax, after elective caesarean section, the baby is not stressed and often has 'wet lungs' followed by forced respiration that may lead to pneumothorax ^(12,13). in agreement with this study, 53% of patients were delivered by caesarean section.

the most common coexisting pulmonary pathologies observed in the present study are respiratory distress syndrome and meconium aspiration, were similar to those published elsewhere ^(14,15). pulmonary pathology is an important risk factor and affect latter prognosis.

In the present study, eight of sixty cases (13%) including four of six fatal cases (67%) were received mechanical ventilation. These observations suggest that mechanical ventilation is an important risk factor and can affect the prognosis of pneumothorax. Clinical data suggest that complications such as barotraumas and air-leak syndromes can negatively affect long-term pulmonary and non-pulmonary outcomes during mechanical ventilation ^(16, 17, 18). Single-lung ventilation, high peak inspiratory pressure and high positive end expiratory pressure application are among the factors

that can induce pneumothorax during mechanical ventilation ^(19,20).

It has been reported that between 15% and 25% of pneumothorax cases are bilateral and two thirds of unilateral pneumothorax involves the right lung ^(20, 21). pneumothorax was observed on the right side in 77% of patients in this present study.

pneumothorax is generally observed in the first 3 days of life. in this present study, pneumothorax developed during the first 48 hours post-delivery in 42 cases (70%). In agreement with the literature ^(21,22).

The main treatment for patients with pneumothorax is the application of a chest tube. pneumothorax resolved spontaneously in four cases in the present study. For patients connected to a mechanical ventilator, the preferred treatment was chest tube drainage. Thirty six of the fifty six cases with chest tube drainage in the present study, the air leak ceased in the first 12 – 24 hour.

The present study showed that mortality rates are increased with preterm deliveries, mechanical ventilation and pulmonary pathology. In agreement with the others ^(22,23,24). four of six fatal cases (67%) were premature, four of six fatal cases (67%) had hyaline membrane disease, four of six fatal cases (67%) received mechanical ventilation.

Patients with respiratory distress and coexisting risk factor need careful evaluation for pneumothorax in order to early recognize and interfere to get rapid recovery and fewer complications.

Conclusion

1. Patients at risk (premature, product of caesarean section, pulmonary pathology, mechanical ventilation) should be kept on continuous monitoring.
2. Any neonate of risk group with signs of respiratory distress must be carefully evaluated by the neonatologist and pediatric surgeon.

3. Treatment is effective, even in a group with high risk, if the disease is recognized in adequate timely fashion.
4. mortality in neonatal pneumothorax is more common in the population of premature babies, patients on mechanical ventilation and those with primary pulmonary pathology.

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